PHOTO PROVIDED

Jordan Bush, left, and Darren Crisman prepare their carbide cannon.

Combustion and Projectiles

By JORDAN BUSH
AND DARREN CRISMAN
Seniors

In physics this year, one of the concepts we learned about was projectile motion. For our physics semester project, we decided to build a calcium carbide cannon and a tennis ball mortar to demonstrate this motion.

As a class, we had investigated projectiles when we made a catapult. In this project, we wanted to utilize combustion (chemical) as our input force rather than muscle (physical).

BUSH

The readers may recognize either one of our launchers as the classic "potato launcher".

The calcium carbide cannon was made entirely of small diameter PVC pipe. A projectile, in our case a small piece of potato, was placed snugly in the front end of the barrel.

CRISMAN

Calcium carbide (CaC2) was dropped into a chamber in the back that was filled with about one-half cup of water.

The solid CaC2 immediately reacted with the water to produce a highly flammable gas, acetylene, along with hydrated lime and heat.

We then lit the gas through a small hole in the top of the chamber, and the explosion forced the potato out of the barrel at a decent velocity.

On launch day, we had trouble igniting the gas due to wind, as it was difficult to get the flame in the small opening above the reaction chamber.

The tennis ball mortar was also made from PVC pipe, in addition to three metal tennis ball cans. We first cut out the bottom of two of the cans, leaving about one- half inch of metal around the circumference to create baffles.

The baffles help increase the distance the ball travels when launched as they create a higher pressure inside the mortar, causing a more explosive release.

We then poked a hole in one side of the remaining can and taped all three together. After wrapping several layers of duct tape around the three connected cans, we secured this barrel inside a piece of 4-inch PVC pipe using screws.

We thought the set-up would be more stable if attached to a tripod, so we designed and built our own tripod with PVC pipe.

In order to fire the cannon, we used one-half teaspoon of non-butane lighter fluid (used to achieve a longer burn) which we poured down the barrel, and pushed the tennis ball into the cans. After waiting twenty seconds, we ignited the fluid through the hole in the side of the bottom can. The ball was propelled out of the mortar and flew in a parabolic trajectory about 100 feet. It was somewhat difficult to get the lighter fluid evenly distributed around the barrel, which reduced the distance our projectile traveled.

Our class found this hands-on activity very educational and interesting. We learned about combustion and projectile motion, and the physics of devices that combine both in the study of ballistics.

inside

A closer look inside our schools from the students' perspective

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This page was created by students at St. John Neumann Regional Academy

Science at work

PHOTO PROVIDED

Above, Bridget Norris, left, and Megan Winters add baking powder to their volcano, and at right, is the volcano as it erupts.

The Chemistry of a Volcanic Eruption

By BRIDGET NORRIS AND
MEGAN WINTERS
Sophomores

The Neumann Volcano Team demonstrated the eruption of three homemade volcanoes on April 28 at the PA National Guard Armory just down the street from the SJNRA High School Campus.

The team members included Sophomores Dylan Holdren, Devin Bierly, Sarabeth Ciccarelli, Megan Winters, Bridget Norris and Khalil Tindal.

Our team worked on this project for two months as part of our study of chemical and physical reactions. The reactions we demonstrated were:

- H2O2 + yeast ? C02 + H2O

(hydrogen peroxide and yeast - chemical)

- NaHCO3 + CH3COOH ? CH3COONa + H2O + CO

(baking soda and vinegar - chemical)

- Mentos and diet soda (physical)

We also used frozen CO2 (dry ice) for effect.

The first volcano was decorated with polka dots and was named "The Beast". We put three packages of quick-rise yeast and one bottle of hydrogen peroxide into a long-necked Erlenmeyer flask.

NORRIS

WINTERS

The reaction, however, did not go high enough to come out of the top of the volcano. We felt the bottom of the flask and it was hot, so the reaction did occur.

But, we determined that the neck was too long for the carbon dioxide gas to be able to escape.

The next volcano was black with a white top and was composed of a 2-liter bottle of diet soda.

We added a roll of fruity Mentos all at once down the top.

As soon as the Mentos hit the soda, the volcano erupted and spewed out diet drink and candy. The "ejecta" was placed back in the volcano and it bubbled out again.

The last volcano was made of Crayola clay. The baseboard was painted purple and cleverly decorated with dinosaurs.

The reaction was made from vinegar and baking soda. The vinegar was dyed red, and dry ice was placed around the base of the volcano so that the lava would "steam" and be more realistic. We found that the volcano continued to erupt as long as vinegar and baking soda were in the tube.

Prior to "Launch Day," we worked for two months testing reactions and building our volcanoes.

The team consisted of sophomore chemistry students, and during this preparation time, we learned many things.

We learned practical things, including being resourceful and safety-conscious.

We gained a better understanding of chemistry by predicting what substances would react and why. We also learned another valuable lesson: the products of reactions using even household items can be dangerous.

Chemistry is an amazing class, and these types of hands-on projects make it even better.

PHOTOS PROVIDED

Mitchell Berninger, left, prepares to launch a rocket and Jordan Bush prepares a tennis ball mortar.

St. John Neumann's Team Rocket: All Systems GO

By LORENA MALIN, JUNIOR

The morning air was crisp and the sky clear.

This was the moment the members of St. John Neumann's Team Rocket had prepared for over the past two months.

MALIN

Armed and ready to launch with five rockets in hand were: Senior Cody Foulkrod, Junior Lorena Malin, and Sophomores Mitchell Berninger, Nick Ward, Jaron Youmans, and Isaac Bower.

The first rocket launched was the "Alpha".

With its silver casing and bright orange tip, it looked like a bullet as it rocketed toward the sky. Although it appeared to be small, it reached a maximum height at 1200 feet.

PHOTO PROVIDED

Mitchell Berninger, left, and Jaron Youmans are shown with their rockets.

This rocket had been built by Lorena Malin with help from Jaron Youmans and Mitchell Berninger. Due to high winds, the Alpha was never recovered after its first and only successful launch.

The next rocket to reach the loading deck was the "36D Squared".

After struggling for some 15 minutes with technical difficulties trying to get the double engines to simultaneously ignite, Team Rocket had to abort the mission with an unsuccessful launch.

The "Commanche 3" was on deck and ready to go. The launch was successful and it reached its maximum height at 2660 ft. Due to engine failure in the second stage (it was a 3 stage rocket), it fell back to the earth without finishing its run. Upon returning, it was lost to a nearby tree and remains there still today.

Next was the "Estes Express" rocket. As it jumped from the launch pad and into the sky, every eye was glued to its long, slender body and sleek nozzle. When it reached a height of 1200 feet, the first stage detached as planned, but on returning to the earth, it was never recovered. The second stage was found in a nearby neighbor's yard.

The fifth and final rocket was made by Jaron Youmans, which he called the "J9L29Y92". It was our only rocket that was not made from a kit, and the only one that had not one, but three successful launches and recoveries.

Reaching heights of about 800-900 ft. with its rubber tipped nosecone, it would fall back to the earth and launch again. The final launch was the end of this rocket, though, when upon return it took a hard hit to a nearby tree and snapped in half.

Overall it was a very good day. Although not every rocket launched successfully, we learned a lot about propulsion and which motors and nosecones resulted in the farthest distance or greatest speed and why. To finish off the morning, we snacked on rocket shaped cookies from our friends at Roy's Bakery.